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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/540,941	06/29/2005	Jianye Jiang	80363(47762)	3798

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EXAMINER	
LEWIS, BEN	

ART UNIT	PAPER NUMBER
1795	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/540,941	JIANG ET AL.	
	Examiner	Art Unit	
	Ben Lewis	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-10* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-10* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *29 June 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *6/29/05, 4/22/08*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1,7, 8 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over LeCostaouec (U.S. 2003/0219646A1) in view of Ilno et al. (U.S. Pub. No. 2002/0086198 A1).

With respect to claims 1,8 and 10, LeCostaouec disclose carbon fiber reinforced plastic bipolar plates (title) wherein, the starting fiber reinforcement can take on a variety of forms but essentially involves a carbon fiber mat which is woven, non-woven, knit, stitch bonded or a combination of woven, knit, stitch bonded and staple fibers. The mat is subsequently needle punched to orient a large portion of the carbon fibers in the through thickness direction, allowing it to achieve maximum electrical conductivity in the direction where it is the most important. For the bipolar plate, the preferred path is parallel to the plate thickness. Such a carbonaceous mat may include thermoplastic fibers which are then heat molded into the desired shape to create grooves or other surface features heretofore typically achieved by machining. Alternatively, the mats

may be impregnated with a thermoplastic resin (powder or solution form) and molded to shape using suitable temperature and pressure (Paragraph 0014).

With respect to conductive powder, LeCostaouec teach that the use of heat-treated pre-oxidized carbon fiber (conductive powder), heat-treated thermoset pitch fiber, carbon PAN fiber or pitch carbon fiber through the thickness of the bipolar plate will optimize electrical and thermal conductivity (Paragraph 0030).

With respect to shaping the softened nonwoven fabric, LeCostaouec teach that processing of the final product is accomplished by a number of thermoforming processes (application of temperature and pressure): diaphragm forming, compression molding, pressure/vacuum forming, resin transfer molding, lamination or stamping to consolidate the thermoplastic matrix (Paragraph 0033).

Le Costaouec does not specifically teach the diameter of the fibers. However, Ilno et al. disclose an electrically conducting curable composition and cured product (title) wherein the electrically conducting curable resin composition and cured product thereof not only have high electrical conductivity, but also excellent heat radiation property, high heat resistance and good corrosion resistance, and therefore are suitable for use as a highly electrically conducting material such as separator for fuel cells (See Abstract). Depending on the use end of the curable resin composition or the cured product, it is preferable to use graphite as the main component and structure the entire carbonaceous filler by a combination or composite system with carbon black and/or carbon short fiber (preferably with carbon short fiber) (Paragraph 0029). Examples of the carbon short fiber include middle carbon fiber, vapor grown carbon fiber and carbon

nanotube. From the standpoint of improving the electrical and mechanical properties, the carbon short fiber is more preferably vapor grown carbon fiber having a fiber diameter of 0.05 to 10 μm and a fiber length of 1 μm to 5 mm and/or carbon nanotube having a fiber diameter of 0.005 to 5 μm and a fiber length of 1 to 100 μm (Paragraph 0030). Therefore it would have been obvious to one of ordinary skill in the art to incorporate the fiber diameter of Ilno et al. in the separator production of Le Costaouec because Ilno et al. teach that from the standpoint of improving the electrical and mechanical properties, the carbon short fiber is more preferably vapor grown carbon fiber having a fiber diameter of 0.05 to 10 μm and a fiber length of 1 μm to 5 mm and/or carbon nanotube having a fiber diameter of 0.005 to 5 μm and a fiber length of 1 to 100 μm (Paragraph 0030).

With respect to claim 7, LeCostaouec teach that Processing of the final product is accomplished by a number of thermoforming processes (application of temperature and pressure): diaphragm forming, compression molding, pressure/vacuum forming, resin transfer molding, lamination or stamping to consolidate the thermoplastic matrix. 0033

3. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over LeCostaouec (U.S. 2003/0219646A1) and Ilno et al. (U.S. Pub. No. 2002/0086198 A1) in view of Kitade et al. (U.S. Patent No. 2003/0129471 A1).

4. With respect to claim 2, LeCostaouec as modified by Ilno et al. disclose a bipolar plate in paragraph 3 above. LeCostaouec as modified by Ilno et al. do not specifically teach that the nonwoven fabric has an content of the electrically conductive powder of 70 wt% or more. However, Kitade et al. disclose a composite material for fuel separator (title0 wherein, from the view point of properties such as surface smoothness of the obtained separator and cell performance, it is desirable that volatile components in the carbonaceous powder are 2% by weight or less, particularly 1% by weight or less. Also, the fixed carbon content (electrically conductive carbon powder) is preferably 98% by weight or more, particularly preferably 99% by weight or more (Paragraph 0029). Therefore it would have been obvious to one of ordinary skill in the fuel cell bipolar plate manufacturing art at the time the invention was made to incorporate the carbon content of Kitade et al. into the bipolar plate fabrication of LeCostaouec as modified by Ilno et al. in order to enhance cell performance.

5. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over LeCostaouec (U.S. 2003/0219646A1) and Ilno et al. (U.S. Pub. No. 2002/0086198 A1) in view of Kitade et al. (U.S. Patent No. 2003/0129471 A1).

With respect to claim 3, LeCostaouec as modified by Ilno et al. disclose a bipolar plate in paragraph 3 above. LeCostaouec as modified by Ilno et al. do not specifically teach that the electrically conductive powder has an average particle size which is at least ten times the diameter of the thermoplastic resin fibers and not more than one third the length of the thermoplastic resin fibers.

However, Kitade et al. disclose a composite material for fuel separator (title0 wherein, From the viewpoint of properties such as separator performance, particle size (primary particle size) of the carbonaceous powder is preferably 1,000 .μm or less, more preferably 500 μm or less, particularly preferably 300 μm or less, as maximum particle size. However, from the viewpoint of properties such as moldability and performance of the separator, it is desirable that fine powders (e.g., fine powders of 0.1 μm or less) are not contained, so that the average particle size is preferably from 1 to 100 μm more preferably from 3 to 70 . μm particularly preferably from 5 to 50 μm (Paragraph 0030).

Kitade et al. also teach that in the case of a carbonaceous powder such as carbon fiber, it is desirable that the fiber diameter is generally from 1 to 50 μm, preferably from 3 to 20 μm, particularly from 4 to 15 μm. The fiber length is generally from 10 to 500 μm, preferably from 50 to 500 μm more preferably from 100 to 500 μm. In this connection, this fiber length is average fiber length in a composite material for fuel cell separator molding (Paragraph 0031).

. Therefore it would have been obvious to one of ordinary skill in the fuel cell bipolar plate manufacturing art at the time the invention was made to incorporate the carbonaceous powder diameter of Kitade et al. into the bipolar plate fabrication of

LeCostaouec as modified by Ilno et al. in order to enhance moldability and performance of the separator (Paragraph 0030). .

6. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over LeCostaouec (U.S. 2003/0219646A1) and Ilno et al. (U.S. Pub. No. 2002/0086198 A1) in view of Wilde et al. (U.S. bub. No. 2003/0194557 A1).

With respect to claim 4, LeCostaouec as modified by Ilno et al. disclose a bipolar plate in paragraph 3 above. LeCostaouec as modified by Ilno et al. do not specifically teach wherein the nonwoven fabric has a porosity of 50% or more. However, Wilde et al. disclose a carbon fiber electrode substrate for electrochemical cells (title) wherein, The electrode substrate of the invention is obtained as rolled good (rollable to a reel diameter of from about 250 to about 300 mm) with a large porosity (in excess of 80%) as necessary for unhindered mass transfer without undue lowering of the conductivity (Paragraph 0022). Therefore it would have been obvious to one of ordinary skill in the fuel cell bipolar plate manufacturing art at the time the invention was made to incorporate the separator porosity of Wilde et al.. into the bipolar plate fabrication of LeCostaouec as modified by Ilno et al. so that there would be unhindered mass transfer of the filler material without undue lowering of the conductivity. .

7. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over LeCostaouec (U.S. 2003/0219646A1) and Ilno et al. (U.S. Pub. No. 2002/0086198 A1) in view of Sakamoto et al. (U.S. bub. No. 2003/0180597 A1).

With respect to claim 5, LeCostaouec as modified by Ilno et al. disclose a bipolar plate in paragraph 3 above. LeCostaouec as modified by Ilno et al. do not specifically teach wherein the thermoplastic resin fibers are polyarylene sulfide resin-fibers. However, Sakamoto et al. disclose a conductive composition for solid polymer type fuel cell wherein, the functioning temperature of a polymer electrolyte fuel cell is generally around 80 ^{o}C. Therefore, resins that have high durability under high temperatures are preferable. Examples of preferable resins include engineering plastics which resist deterioration due to hydrolysis or the like. Particularly preferable are thermoplastic engineering plastics (polyarylate resins, polyamide resins, polyarylene ether resins, polyarylene sulfide resins, polyaryl ether ketone resins, polyether imide resins, polyaryl sulfone resins, etc.). Among these, resins having a high chemical resistance and high strength are particularly preferable. Examples of preferable thermosetting resins include phenol resins (resol- or novolac-resin), epoxy resin, diallyl phthalate resin, etc. As the thermoplastic resins, in view of moldability, chemical resistance, durability, mechanical strength, and the like, poly(phenylene sulfide) resins, fluoro carbon resins, and the like are preferable (Paragraph 0083)

Therefore it would have been obvious to one of ordinary skill in the fuel cell bipolar plate manufacturing art at the time the invention was made to incorporate the polyarylene sulfide resin of Wilde et al.. into the bipolar plate fabrication of LeCostaouec as modified by Ilno et al. because polyarylene sulfide resins have high durability under high temperatures.

8. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over LeCostaouec (U.S. 2003/0219646A1)

With respect to claim 6, LeCostaouec disclose a bipolar plate in paragraph 3 above. LeCostaouec do not specifically teach the electrically conductive powder is uniformly distributed with in the nonwoven fabric. However, it would have been obvious to one of ordinary skill in the fuel cell bipolar plate manufacturing art at the time the invention was made to distribute the conductive powder of LeCostaouec uniformly within the nonwoven fabric because in order have a defect free product that is uniform in conductivity. Ex Parte Smith, 83 USPQ.2d 1509, 1518-19 (BPAI, 2007) (citing KSR v. Teleflex, 127 S.Ct. 1727, 1740, 82 USPQ2d 1385, 1396 (2007)).

9. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over LeCostaouec (U.S. 2003/0219646A1) and Ilno et al. (U.S. Pub. No. 2002/0086198 A1) in view of Kitade et al. (U.S. Patent No. 2003/0129471 A1).

With respect to claim 9, LeCostaouec as modified by Ilno et al. disclose a bipolar plate in paragraph 3 above. Applicant's specification recites that "a content of the conductive powder in the nonwoven fabric can be set as appropriate for the conductivity, mechanical strength, gas sealability, and other characteristics required of the target fuel cell bipolar plate. However, the content is preferably 70 wt % or more, and more preferably 80 wt % or more. By setting the content of the conductive powder within the above range, a low-resistance fuel cell bipolar plate having a volume resistivity in the thickness direction of 30 mOhm-cm or less can be manufactured. By

using this fuel cell bipolar plate, a fuel cell having a better power generating efficiency can be achieved (Paragraph 0083).

However, Kitade et al. disclose a composite material for fuel separator (title) wherein, from the view point of properties such as surface smoothness of the obtained separator and cell performance, it is desirable that volatile components in the carbonaceous powder are 2% by weight or less, particularly 1% by weight or less. Also, the fixed carbon content (electrically conductive carbon powder) is preferably 98% by weight or more, particularly preferably 99% by weight or more (Paragraph 0029). Therefore it would have been obvious to one of ordinary skill in the fuel cell bipolar plate manufacturing art at the time the invention was made to incorporate the carbon content of Kitade et al. into the bipolar plate fabrication of LeCostaouec as modified by Ilno et al. in order to enhance cell performance.

LeCostaouec as modified by Ilno et al. and Kitade et al. do not disclose any volume resistivity dada. However, it is the position of the examiner that such properties are inherent, given that LeCostaouec as modified by Ilno et al. and Kitade et al. and the present application utilize a percentage of conductive material that is within the claimed range of applicant that would result in the claimed resistivity value . A reference which is silent about a claimed invention's features is inherently anticipatory if the missing feature is necessarily present in that which is described in the reference. In re Robertson, 49 USPQ2d 1949 (1999).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ben Lewis whose telephone number is 571-272-6481. The examiner can normally be reached on 8:30am - 5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Ben Lewis/
Examiner, Art Unit 1795

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